focus on energy

renewable energy success story

Iowa's First Methane Energy Recovery Project at a Dairy

Iowa's first cow-manure methane recovery system is turning waste into electricity in northeast Iowa. Add the benefits of odor and air emission reductions into the mix, and this dairy farm is operating a promising technology for Iowa's future.

Top Deck Dairy, Inc., Westgate, is owned by Judy and Roger Decker along with their sons, Derek, Jason and Justin. The family has installed a system that captures methane from decomposing manure to produce electricity.

Alliant Energy owns the generators and sends any electricity not used on the farm to its grid.

The Construction Process

When the Decker family decided to expand its dairy operation from 300 to 700 cows, they researched the potential of installing an anaerobic digester for electricity production.

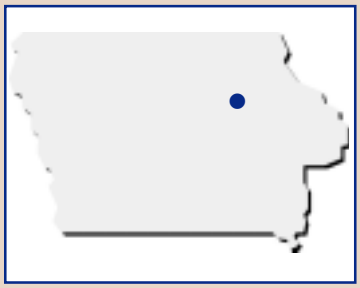
The Department of Natural Resources and the USDA Natural Resource Conservation Service provided a $157,900 grant to build the digester, while Alliant Energy supplied $250,000 for the generators and to connect the system to the utility grid. Top Deck Dairy funded the remaining costs of the $502,000 facility.

Construction of the system began in the fall of 2000. Dan Meyer, Iowa State University Extension engineer, coordinated construction of the project, and electricity production began in May 2002. To date, the system has operated successfully, with no major mechanical problems.

At a Glance:

Top Deck Dairy, Inc.

Westgate, Iowa



Type of Operation: A 700-cow dairy operation
Owners: Judy and Roger Decker, with their sons Derek, Jason and Justin
Facilities Description: 300-cow and free stall barn and parlor built in 1997; 350-cow barn and connecting alley completed in May 2001. Methane recovery system is a plug flow digester
Energy Savings through Methane Energy Recovery: $40,600 annually through avoided electricity and heat costs, including income from selling excess gas used in generators

The Science

Methane is the main component of natural gas. It is also a component of biogas, which is generated during the decay of organic (living or once-living) materials in an anaerobic, or oxygen-free, environment. Oxygen-free conditions occur in natural systems such as the bottom layers of wetlands and bogs, and in artificial systems like landfills, lagoons, and specially designed tanks called anaerobic digesters. The methane produced can be burned to generate heat or electricity.

The Technology

The Deckers installed a system called a plug-flow digester that treats the manure. About 17,000 gallons of manure produced daily is scraped to

–more–

the digester, where it decomposes and produces methane.

The captured methane is sent through a connecting pipe to Alliant Energy's 150-horsepower engine with a 100kW generator and a 30kW microturbine. The generators produce 864,000 kWh of electricity annually, enough to power 100 homes. Some of the electricity is used on the farm, with excess sent to Alliant's electricity grid.

Heat from the engine and microturbine are captured to preheat the manure, improving the anaerobic process, and used to heat the parlor area, where the cows are housed.

The Benefits

Interest is growing in methane recovery at livestock operations because of the environmental and economic benefits that can be generated. Capturing methane can reduce odor and decrease the potential for pollution. While systems are currently expensive, their societal and environmental benefits may outweigh the cost.

Just as importantly, methane recovery develops a renewable energy resource, offsets fossil fuel consumption, and further reduces environmental pollutants.

Offsetting energy use through on-site power production also reduces energy bills. Top Deck is the first dairy in Iowa to put power on the electrical grid, and is one of 20 operating in the country today.

The Potential

The Top Deck Dairy project demonstrates the effectiveness of methane recovery, especially at larger livestock facilities. Each year, Iowa's livestock confinement operations – including cattle, hogs and chickens — produce 81 million tons of manure. This amount has the potential to generate 2.8 billion kWh of electricity each year, equivalent to the energy consumed by 325,000 homes.

For more information on methane recovery in Iowa, contact Jim Bodensteiner with the DNR at (515) 281-8416; e-mail: Jim.Bodensteiner@dnr.state.ia.us

Facts & Figures

Top Deck Dairy, Westgate, Iowa

Digester System:

- Plug-flow digester tank is 27 feet x 124 feet x 12 feet deep. Two additional 13 feet x 13 feet tanks preheat manure.
- 17,000 gallons of manure produced daily at the facility are used for methane production

Electricity Production:

- 150 horsepower 6 cylinder engine powers a 100 kW generator
- 30 kW microturbine generator
- 864,000 kWh of electricity are produced annually, enough to power 100 homes

Environmental Benefits:

The electricity produced from this renewable resource annually avoids:

- 432 tons of coal
- 1,808 tons of carbon dioxide

About 17,000 gallons of manure produced daily from 700 cows is scraped to a digester system for methane recovery.

Project Investment and Savings:

- Total cost of construction for system: $502,000
- $157,900 in funding came from Iowa DNR and the NRCS
- $250,000 came from Alliant Energy

Project Partners:

- Dan Meyer, project manager, ISU Extension
- Iowa Department of Natural Resources
- USDA's Natural Resources Conservation Service (NRCS)
- Alliant Energy

Additional Information on Methane Energy Recovery:

Methane Energy Information from U.S. EPA
www.epa.gov/agstar OR www.epa.gov/methane
Consumer Methane Energy Information from U.S. DOE
www.eren.doe.gov/consumerinfo/refbriefs/ab5.html

Contact the Iowa DNR today to learn more about renewable energy in Iowa!
Go to: www.iowadnr.com/energy/